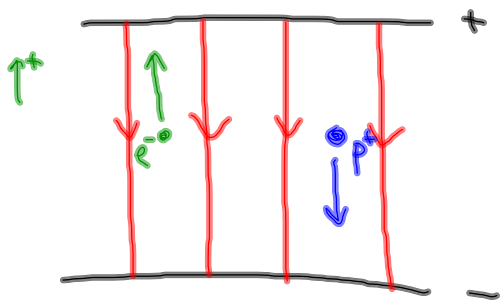
Circuit Notes 1st Block 11.10.11

An electron and a proton are each placed at rest in an external uniform electric field of magnitude 520 N/C. Calculate the speed of each particle after 48 ns.

* ignore gravity



e^- : $V_f = V_i + at$ ($V_i = \emptyset$) $\Sigma \bar{F} = m_e \bar{a}$

$$a = \frac{\Sigma F}{m_e} = \frac{F_e}{m_e} \text{ (electric force)} = \frac{E q_e}{m_e}$$

$$\bar{E} = \frac{\bar{F}_e}{q} \qquad F_e = Eq$$

$$V_f = \frac{E q_e t}{m_e}$$

$$V_f = \frac{(520\ N/C)(1.6E{-}19\ C)(48E{-}9\ s)}{(9.109E{-}31\ kg)}$$

$$= 4.38E6\ m/s$$

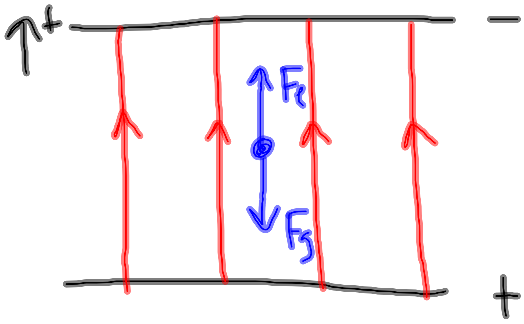
p^+ : $V_f = \dfrac{E q_p t}{m_p}$

$$= \frac{(520\ N/C)(1.6E{-}19\ C)(48E{-}9\ s)}{(1.673E{-}27\ kg)}$$

$$= 2387\ m/s$$

Circuit Notes 1st Block 11.10.11

An object with a net charge of 24 microC is placed in a uniform electric field of 610 N/C, directed vertically. What is the mass of this object if it floats in this electric field?



$q = 24\ \mu C$

$E = 610\ N/C$

$m = ?$

$a_g = 9.8\ m/s^2$

$$\Sigma \vec{F} = \emptyset$$

$$F_e - F_g = \emptyset$$

$$F_e = F_g$$

$F_g = m a_g$

$$qE = m a_g$$

$F_e = qE$

$$m = \frac{qE}{a_g}$$

$$= \frac{(24E\text{-}6\ C)(610\ N/C)}{(9.8\ m/s^2)}$$

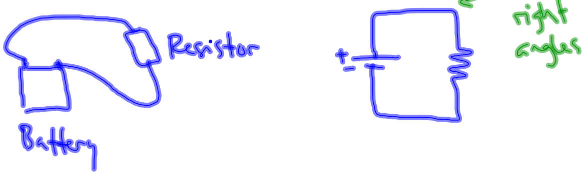
$$= 1.49E\text{-}3\ kg$$

Circuits:

- Common Pieces:

Piece	Schematic representation
Wire	
Battery	
Resistor	
Capacitor	

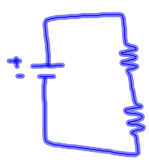
- Schematic drawing to simulate the actual connections.



Physical Schematic

- Ways to Connect Pieces:

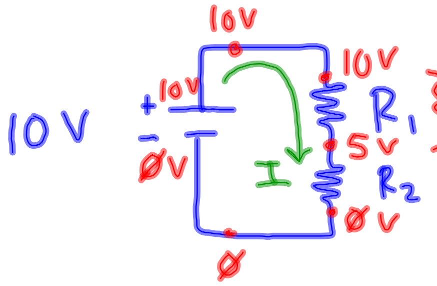
1. Series



- pieces connected back-to-back
- e^- only have one path to go on

- e^- actually move from − to +.
- what we call current (conventional current) goes from + to −.

Series continued:



Voltage Drop

$R_1 = R_2$

Current is the same in both resistors

* More resistance means more voltage drop

• Ohm's Law:

$$V = I R$$

R → resistance

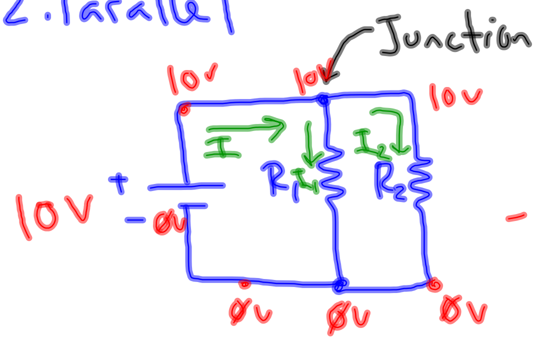
I ↳ current

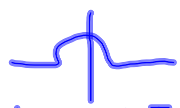
V ↳ voltage

Resistance units: $1\,\Omega = 1\,\frac{V}{A}$

(capital omega)

2. Parallel





lines NOT connected

- Resistors have same voltage
- Current is differnt through resistors